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4 PRWRITY PAPER A/W 4-23-03

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Request for grant of a patent

16 SEP 1999

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1	Your reference	SPG/P36131
2	Patent application number	**9921791.1**
3	Full name, address and postcode of the applicant THE PATENT OFFICE L 16 SEP 1999 RECEIVED BY POST Patents ADP number State of incorporation	FTL Seals Technology Limited Bruntcliffe Avenue Leeds 27 Business Park Morley LEEDS LS27 0TG 7631302002 England & Wales
4	Title of the invention	Seal Assembly
5	Name of agent Address for service Patents ADP number	Harrison Goddard Foote ~~Belmont House~~ ~~20 Wood Lane~~ ~~Headingley~~ Leeds ~~LS6 2AE~~ TOWER HOUSE MERRION WAY LEEDS. LS2 8PA SH 27/6/00 16571001

6	Priority applications	Country	Priority App No	Date of Filing

7	Parent application (eg Divisional)	Earlier Application No	Date of Filing

8	Statement of Inventorship Needed?	
9	Number of sheets for any of the following (not counting copies of same document)	
	Continuation sheets of this form	
	Description	4
	Claims	2
	Abstract	
	Drawings	3 + 3
10	Number of other documents attached	
	Priority documents	
	Translations of priority documents	
	P7/77	
	P9/77	1
	P10/77	
	Other documents	

11 I/We request the grant of a patent on the basis of this application.

Signature S.P. Gilholm Date 15 Sep 1999

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SEAL ASSEMBLY

This invention relates to a novel seal assembly.

Natural gas is commonly transported, in bulk, across land through large diameter (eg 24 inch) steel pipelines. It is not uncommon to introduce offtakes or three way joints at certain points on the main transmission pipeline. Currently, a three way joint is welded into the pipeline, following the removal of a section of pipe. This procedure when carried out with gas loaded into the line is hazardous and expensive, involving the installation of a secondary "loop" through which to bypass the gas whilst the joint is installed.

We have now found a novel form of seal which is capable of acting as a primary sealing element that can provide a seal between a main transmission line and bonded branch connection. The seal must withstand service and test pressure including pressure reversals and must also be able to accommodate eccentricity of the branch connection to the main pipeline.

Copending British Patent Application No 9917 360.1 describes a novel method of securing a branch assembly to a pipeline. Such a method requires a specialised seal which is not only adapted to operate under significant pressures but can also be fitted to non-planar or arcuate surfaces.

It is known to use "U" ring seals in pressure systems wherein the pressure acts on the side wall of the U ring. However, we have now surprisingly found a novel seal assembly which is sufficiently flexible so as to be adaptable to fit parallel, planar, arcuate or convex surfaces.

Thus according to the invention we provide a seal assembly adapted for use in a pressurised system which comprises a ring seal provided with at least a pair of

primary sealing lips radially disposed on the inner circumferential face of the ring, the outer axial face of the ring seal being provided with means for dispersing pressurised fluid.

The seal of the invention is advantageous in that it is especially useful in pressure systems since the pressure acts on the walls of the lips and the portion of the seal joining the lips to enhance the pressurised fluid seal produced. The seal will hereinafter be described as a radial U ring seal.

The dispersing means may comprise a labyrinth seal, which may be located on the axial face of the seal. In a preferred embodiment both axial faces of the radial U ring seal are provided with a pressurised fluid dispersing member, in which case the labyrinth seals may be the same or different.

Labyrinth seals are known to cause reductions in pressure along the axial length of the seal. Thus, the labyrinth seals used may comprise an array of apertures. Alternatively, the labyrinth seals may only be partially cut through such that the seal comprises a plurality of hollows or holes. The apertures or holes may be arranged irregularly or preferably, in a regular pattern. When a regular pattern is used a 'brick-bond' pattern is preferred. Although it is within the scope of the present invention for the labyrinth seals to be separate to the radial U ring seal, or to be bonded to the radial U ring seal, it is preferred that the labyrinth seal is an integral part of the radial U ring seal. When the apertures or holes are in a regular pattern they may comprise two or three circumferential rows. Two circumferential rows are preferred.

The thickness of the labyrinth seal may vary, but is preferably from 1 to 5mm, more preferably from 1.5 to 3mm. The dimensions of the apertures or holes may also be varied depending upon, *inter alia*, the pressure which the seal is subjected to, the material of which the seal comprises, etc. However, it is preferred that the apertures or holes have a depth of from 0.5 to 2.0 mm and more preferably from 1.0 to 1.5 mm. For ease of manufacturing the apertures or holes are preferably substantially the same

size and shape and may be substantially rectangular with dimensions of from 2 to 4mm by 5 to 7 mm, preferably 3 by 6mm. When rectangular apertures/holes are used then the longest side is preferably circumferential.

Any conventionally known materials may be used in the manufacture of the seals of the invention and preferably the labyrinth seal portion comprises the same material as the U ring portion of the seal. Such materials include, but are not limited to rubbers, such as nitryl rubbers, eg acrylonitrile butadione copolymer (NBR).

The pressure which the seals of the invention are designed to tolerate may be up 105 to 110 bar under test conditions and from 20 to 70 bar under conventional operating conditions.

Under operating conditions there may be a risk of circumferential extrusion between the outer portion of the seal and the pipes. Thus, in a preferred embodiment a reinforcement member around the outer circumference of the seal eg a coiled spring. The spring is preferentially a metal spring eg a steel spring.

Furthermore, since the seal assembly is free to continually expand in a radial direction under the internal working pressure acting on the lips of the seal. Thus, in a preferred embodiment of the invention the seal may be provided with a containment member. Such a containment member preferentially comprises a metal ring situated on the outer diameter surface of the seal.

The seal assembly of the invention finds utility particularly as large pipeline seals such as may be required in the oil, chemical, water or gas fields. They are capable of sealing surfaces which are parallel; non-parallel, eg by up to 5mm; or convex, eg as may be found when a portion of the side wall of a pipe may be cut away. The seals are especially useful in introducing, for example, a three way joint, into a pipeline by connecting two pipes.

The invention will now be described by way of example only and with reference to the accompanying drawings in which;

Figure 1 is a perspective view of a segment of a conventionally used U ring;

Figure 2 is a perspective view of a segment of a U ring seal of the invention;

Figure 3 is a cross-section of a segment of a U ring seal provided with a labyrinth seal;

Figure 4 is a cross-section of the complete seal of the invention; and

Figure 5 is a plan view of the complete seal of the invention.

Referring to Figure 1 a conventional U ring seal (which is not of the invention) a seal (1) comprises lips (2 and 3) and lip joining section (4) and a body (5). The body (5) has outer walls (6 and 7). The seal (1) which is shown in segment only, is substantially circular such that the wall (6) is on the inside of the circle and the wall (7) on the outside of the circle.

With reference to Figure 2, a radial U ring lip seal (8) comprises lips (9 and 10), a lip joining section (11) and a body (12). The body (12) has outer faces (13 and 14). The seal (8) is substantially circular such the lips (9 and 10) face inwards towards the centre.

With reference to Figures 3 to 5, a lip seal (8) comprises lips (9 and 10), the body (12) of the seal being provided with labyrinth seals (15 and 16) on each face (13 and 14) respectively. The labyrinth seals (15 and 16) are in a "brickwork" arrangement. The body (12) of the seal (8) is provided with a support ring (17) in the form of a coiled spring moulded into the seal body (12). The seal (8) is also optionally provided with a containment ring (18) on the face outermost from the centre.

CLAIMS

1. A seal assembly adapted for use in a pressurised system which comprises a ring seal provided with at least a pair of primary sealing lips radially disposed on the inner circumferential face of the ring; the outer axial face of the ring seal being provided with means for dispersing pressurised fluid.

2. A seal assembly according to claim 1 characterised in that the means for dispersing the pressurised fluid is a labyrinth seal located on the outer side face.

3. A seal assembly according to claim 1 characterised in that both outer side faces of the radial U ring seal are provided with a pressurised fluid dispersing means.

4. A seal assembly according to claim 2 characterised in that the labyrinth seal comprises a plurality of apertures.

5. A seal assembly according to claim 2 characterised in that the labyrinth seal comprises a plurality of holes.

6. A seal assembly according to claims 4 or 5 characterised in that the apertures or holes are arranged in a regular pattern.

7. A seal assembly according to claim 6 characterised in that the regular pattern is a 'brick-bond' pattern.

8. A seal assembly according to claim 1 characterised in that the means for dispersing the pressurised fluid an integral part of the radial ring seal.

9. A seal assembly according to claim 7 characterised in that the apertures or

10. A seal assembly according to claim 9 characterised in that the apertures or holes are in a regular pattern of two circumferential rows.

11. A seal assembly according to claims 4 or 5 characterised in that the apertures or holes are from 0.5 to 2.0mm deep.

12. A seal assembly according to claims 4 or 5 characterised in that the apertures or holes are preferably substantially the same size and shape.

13. A seal assembly according to claim 1 characterised in that the assembly is adapted to tolerate from 20 to 70 bar under conventional operating conditions.

14. A seal assembly according to claim 1 characterised in that the seal is provided with a containment member.

15. A seal assembly according to claim 14 characterised in that the containment member comprises a reinforcement member around the outer circumference of the seal.

16. A seal assembly according to claim 1 characterised in that the reinforcement member is preferentially a coiled spring.

17. A seal assembly according to claim 1 characterised in that the seal is provided with a containment ring around the outer circumference of the seal.

18. A seal assembly substantially as described with reference to the accompanying examples.

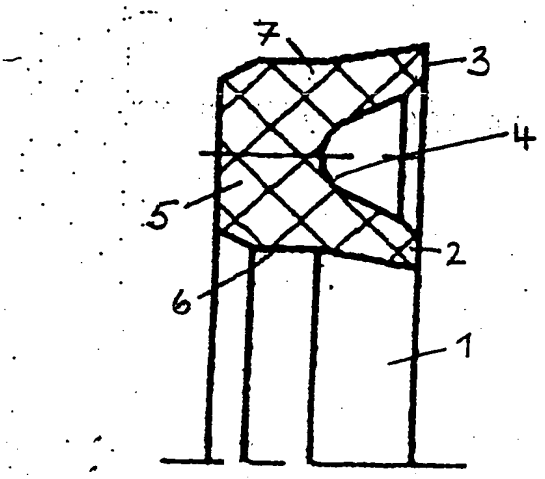

Fig. 1

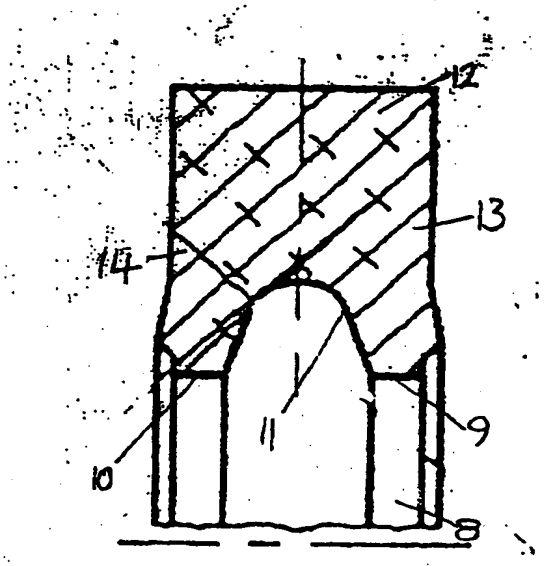

Fig. 2

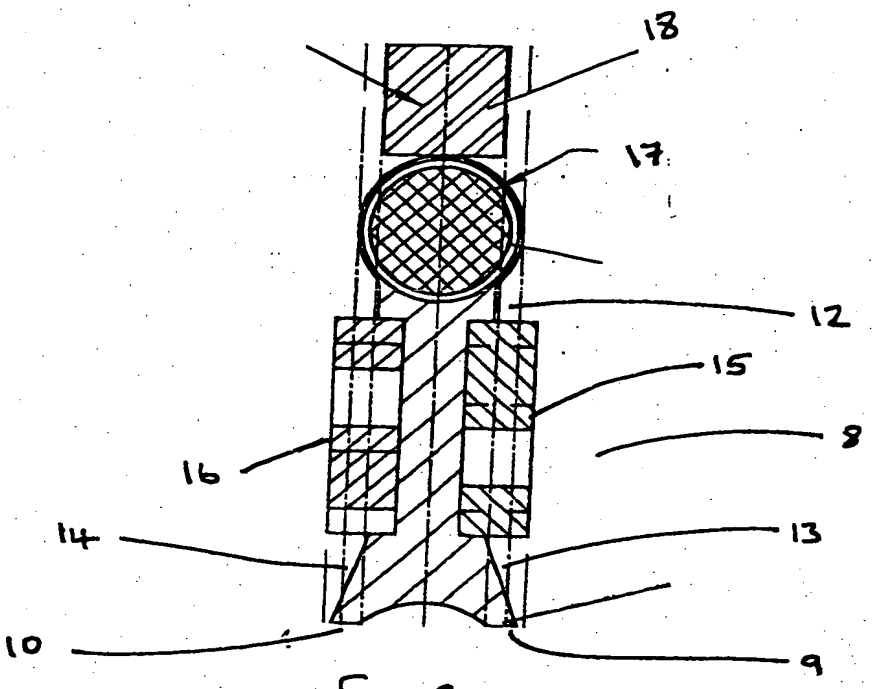

Fig. 3

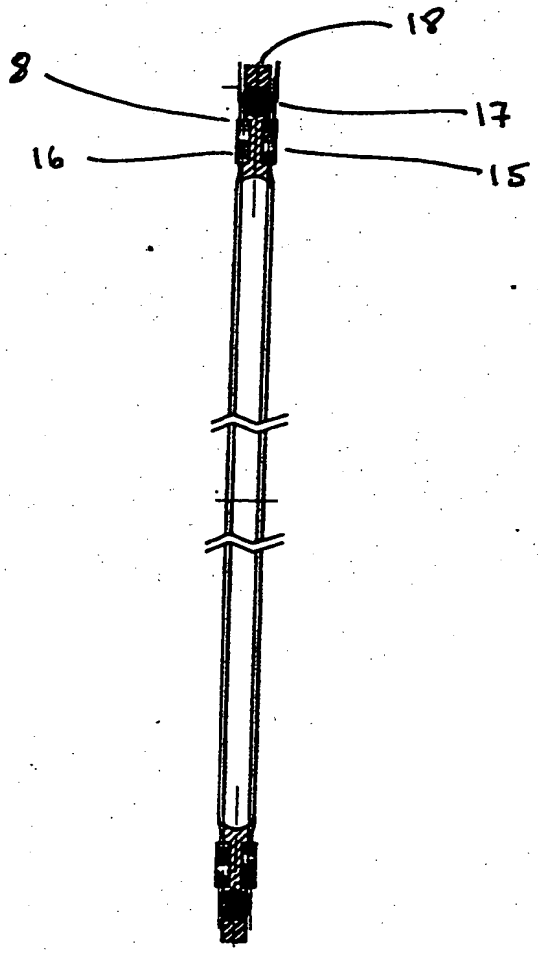

Fig. 4

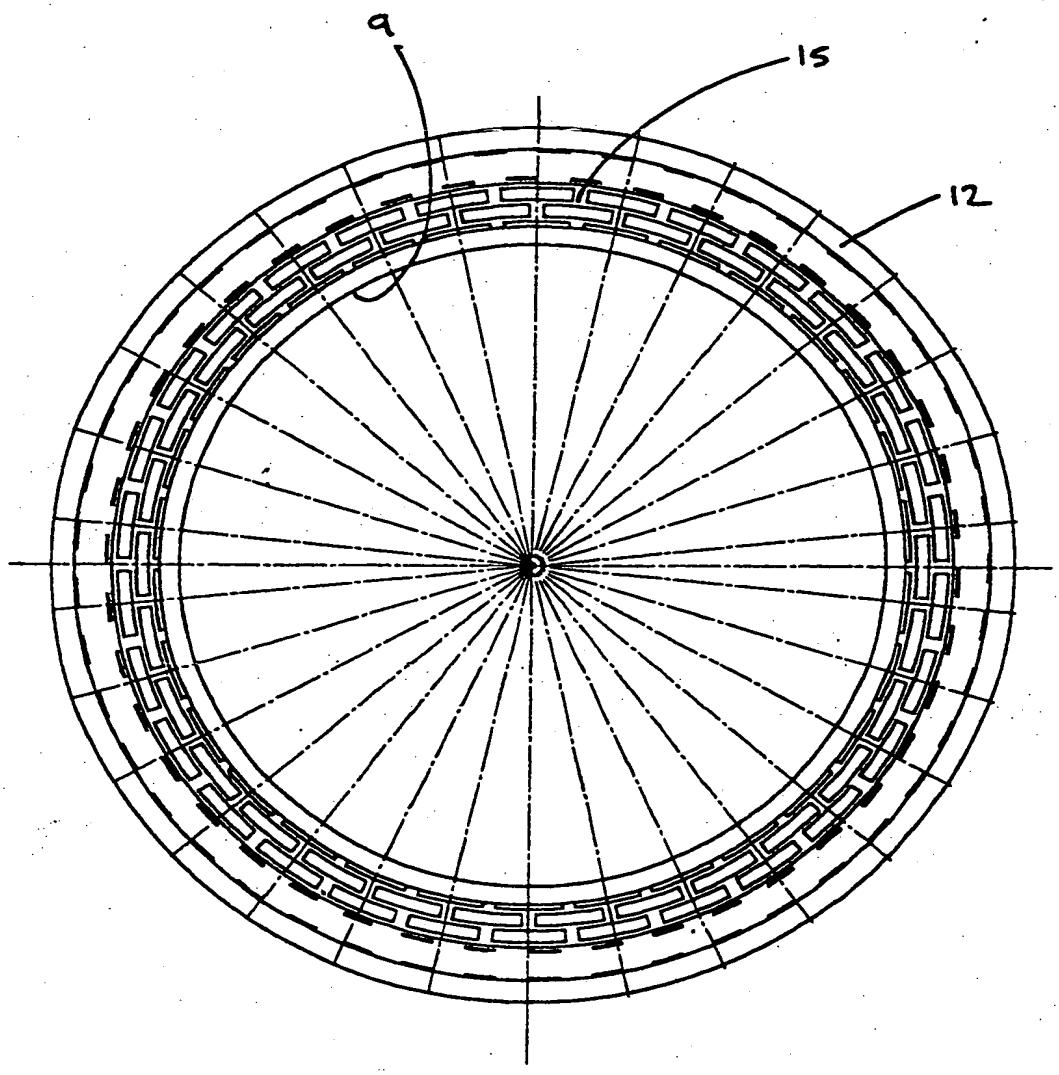

Fig. 5

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